REMARKS

Claims 1–24 are pending; claim 1 has been amended.

The Examiner has objected to the drawings for not illustrating the claimed AND gate. This objection is traversed in view of the following reason(s).

The specification page 11, lines 14–16 state:

> "A chopping unit 100 is preferably constructed using an logic stage such as an AND gate having one input port coupled to receive serial video data via lead 12 from data transmitting unit 10 and a second input port coupled to receive the second clock signal via lead 62"

Fig. 3 shows chopping unit 100. Accordingly, the AND gate is shown as chopping unit 100. Note that block diagrams have been an accepted form of illustrating electrical components in patents for quite some time. Therefore, illustrating an AND gate as a block in a block diagram is deemed proper. Thus, the objection is deemed to be in error and should be withdrawn.

The Examiner has objected to the specification. This objection is traversed in view of the following reason(s).

The Examiner indicates that the "Cross Reference To Related Applications" section of the specification should not include reference to a foreign priority document. The arrangement of the specification is set forth in 37 CFR §1.77(c)(1) as "Cross-reference to related applications, if any. There is no restriction set forth in §1.77 preventing the Applicant from referring to a

foreign application. Additionally, there is no statement set forth in the Manual of Patent Examining Procedures (MPEP) which prohibit the inclusion of related foreign applications in the cross-reference section of the specification. Further, the Patent Office has accepted the inclusion of foreign applications in the cross-reference section of the specification by permitting the issuance of numerous patents having this type of cross referencing, for example, U.S. Patent No. 5,457,516, column 1 attached hereto. Therefore, the objection should be withdrawn.

The Examiner has also objected to the description of Fig. 1 being provided on page 7, line 12-page 10, line 8 instead of in the Background of the Invention section of the specification. MPEP 608.01(c) provides guidelines for what should be included in the Background section of the specification, and states:

> "The Background of the Invention ordinarily comprises two parts:
> (1) Field of the Invention: A statement of the field of art to which the invention pertains. This statement may include a paraphrasing of the applicable U.S. patent classification definitions. The statement should be directed to the subject matter of the claimed invention.
>
> (2) Description of the related art including information disclosed under 37 CFR 1.97 and 1.98: A paragraph(s) describing to the extent practical the state of the prior art or other information disclosed known to the applicant, including references to specific prior art or other information where appropriate. Where applicable, the problems involved in the prior art or other information disclosed which are solved by the applicant's invention should be indicated. "

Fig. 1 is a generalization of the prior art, *i.e.,* "an abstract representation showing a simplification of a typical electrophotographic developing type printing process, as set forth in the Brief Description of the Drawings, because there is no published reference which depicts exactly what is shown in Fig. 1. Additionally, there is no suggestion in MPEP 608.01(c) that indicates that a "detailed explanation" of a conventional or prior art figure be provided in the Background section of the specification, much less a detailed description of an abstract

representation of the art. Further, such "detailed explanation" being provided in the Detailed Description section of the specification has been a long accepted practice, see U.S. Patent No. 5,457,516 col. 3, lines 13–16 and 42–67, attached.

Also, MPEP 608.01(g) for the Detailed Description of Invention section states:

> "A detailed description of the invention and ***drawings*** follows the general statement of invention and brief description of the drawings." (emphasis added)

Accordingly, a detailed description of the ***drawings*** should be provided in the specification as set forth by PEP 608.01(g), which does not limit such detailed description to drawings of the invention.

Therefore, the objection should be withdrawn.

Claims 1–24 were rejected under 35 U.S.C. §112, second paragraph based upon a number of deficiencies kindly noted by the Examiner. Accordingly the above amendment is believed to correct for those deficiencies not traversed below.

The Examiner has erroneously indicated that the "mode selecting means" is recited without a function", however, the function is clearly set forth in claim 5 as "enabling a user to change a characteristic of said second clock signal." Therefore, the rejection is in error and should be withdrawn.

The Examiner again rejects claim 1 by stating that the claim recites two functions for a single means. This rejection was traversed in response to the last Office action and case law was

cited therein, and which repeated below. Note that the specification, from page 7, line 18 through page 8, line 9, states:

> "data transmitting unit 10 receives printing data supplied from data output device 1 of a source such as a computer having a RIP (Raster Image Processor), via a bus line 2. Also, transmitting unit 10 converts the print data to a series of lines of video data in correspondence with a clock signal fed in via a line 52 and then, outputs the converted video data via line 12 in response to a horizontal synchronization signal exhibiting a predetermined time interval applied via a line 14".

Whereas, claim 1 calls for:

> *data transmitting means for generating converted data by converting input data to be printed into video data in accordance with a first clock signal, and for transmitting the converted data in response to a horizontal synchronization signal exhibiting a predetermined time interval.*

Further, the specification, page 11, lines 5–11, states:

> "A printing control unit 20 controls the mechanism required for printing the video data by means of electrical signals and provides the beam data used to switch the light generation of light source element 68 located in the beam scanning unit 30 to the light source element via a line 32 to emit light beam 90. The beam data is obtained from the chopped video data fed in via a line 102. Also the printing control unit 20 receives and processes the beam detection signals generated by the light source element through a line 34, and provides via line 14 the horizontal synchronization signal generated by processing the beam detection signals."

Claim 1 also calls for:

> *printing control means for providing beam data in response to said chopped data, for controlling printing of the video data by generating electrical signals to control generation of a light beam by a light source element, and for generating said horizontal synchronization signal in correspondence with a beam detection signal derived from the light beam by the light source element.*

Clearly claim 1 depicts the invention as disclosed. 35 U.S.C. §112, second paragraph states:

> "The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention."

Therefore, since claim 1 sets forth the invention as disclosed and the specification provides clear antecedent basis for the language set forth in claim 1, then the rejection is in error because claim 1 particularly points out and distinctly claims the subject matter which the Applicant regards as his invention. Additionally, there is no provision set forth in 35 U.S.C. §112, second paragraph which prohibits claim language for claiming a single means for performing more than one function.

In re Kelley, 134 USPQ 397 states:

> "We see no reason why a single structural element....which performs two separate functions, cannot support a claim reciting broadly these separate functions." See also *Palmer v. United States*, 163 USPQ 250

Further, 35 U.S.C. §112, sixth paragraph states:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

Note that §112, sixth paragraph, does not prohibit more than one function being specified for the claimed means, but instead denotes that the claimed means must have a function. In other words, one can not claim *means* without including a function for the *means*, because a *means* without a function makes no sense. Further, when using the term "means" without the recital of structure, material, or acts in support thereof, it would not be understood what the "means" should be construed to cover without recitation of the functions performed by the "means."

The Examiner has no discretionary authority for ignoring established case law. Accordingly, the Examiner should either cite case law overturning *In re Kelley*, or withdraw the rejection.

The Examiner has erroneously indicated that due to the lack of structural support for the function indicating that the beam detection signal is derived from the light beam. Claim 1 states, however:

> *a beam detection signal derived from the light beam by the light source element*

Accordingly, since claim 1 indicates that the light source element derives the beam detection signal from the light source, then there is recitation of supporting structure for deriving the beam detection signal.

The Examiner has rejected claim 23 stating "It is not clear what element in the specification corresponds to the clock signal generating means recited in claim 23." First, the Examiner should be more specific in his rejection since there are more than one clock signal generating means set forth in claim 23. Second, depending on which clock signal generating means that is being referred to, the element recited in the specification can be any one of element 40, divider 50 and divider 60.

The specification, page 12, lines 3–8, states:

> "A clock signal generator 40 generates local, or basic, clock signals and then, applies these clock signals to a lead 42. A first divider 50 divides the basic clock signals with a certain dividing ratio and, then provides the first clock signal to lead 52. A second divider 60 divides the basic clock signal according to dividing ratio data component of the video data received via

> lead 2, separated from the video data through output port 5 and fed in through a line 3 and then, provides the second clock signal on a line 62"

Accordingly, the rejection is deemed to be in error and should be withdrawn.

Claims 1–24 were rejected under 35 U.S.C. §103, as rendered obvious and unpatentable, over Applicant's Figs. 1 and 2A–2D, in view of Tomita et al. and Hayashi et al. The applicant respectfully traverses this rejection for the following reason(s).

First, Fig. 1 may represent the prior art but it is not found in any publication. Figs. 2A–2D are derived by the applicant's own work and thus are not prior art. Note that Fig. 1 has only been described as "an abstract representation showing a simplification of a typical electrophotographic developing type printing process". Figs. 2A–2D are the Applicant's own work in deriving signals for illustrative purposes only. Therefore, the rejection using Fig. 1 as prior art is in error and should be withdrawn.

Second, Tomita is for a solid scan device, *i.e.,* a device using an LED array whereas the device in Applicant's Fig. 1 uses a laser beam. One of ordinary skill in the art would not find an LED array to be synonymous with a laser beam. Accordingly, one of ordinary skill in the art would not have been motivated by Tomita to modify Applicant's Fig. 1. Additionally, there is no teaching of a problem with the device of Fig. 1, other than using hindsight by applying Applicant's discovery of a problem, which would motivate one of ordinary skill in the art to make the modification as proposed by the Examiner. Neither Tomita nor Hayashi indicate that a laser scanning device similar to that of Applicant's Fig. 1 has a problem needing to be corrected. Accordingly, the rejection is deemed to be in error and should be withdrawn.

Third, AND gate circuit 3 in Tomita comprises a plurality of AND gates, each AND gate gating a corresponding pixel in response to a corresponding strobe signal, wherein each strobe signal may have a different frequency and duty cycle depending on the characteristics of each corresponding LED, col. 2, lines 41–64. Note that Tomita needs to overcome specific characteristic flaws of the employed LEDs. Since scanning unit 30 in Applicant's Fig. 1 is a laser beam scanner: *The beam scanning unit 30 is switched over according the beam data provided on the line 22 to generate the laser beam to be scanned upon the photosensitive, uniformly changed circumferential surface of the drum*, page 8, lines 14–16; there is clearly no need for a circuit having a plurality of AND gates corresponding to a plurality of pixels when the output of data transmitting unit 10 is not a plurality of parallel pixels, and there are no LEDs in Applicant's Fig. 1 which may be in need of having characteristic flaws therein corrected.

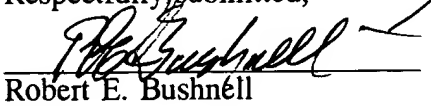
Additionally, chopping unit 100 of Applicant's Fig. 3 is defined as and has the function of: *chopping the converted video data applied through lead 12 in response to the second clock signal fed in via a lead 62, is provided to lead 102 as the chopped video data. Here, the term "chopped" means that the video data is divided according to the second clock signal. This is carried out by gating of the AND gate with the second clock signal*; page 11, line 14–page 12, line 2. None of the A?ND gates in Tomita's AND gate circuit 3, however, divides the corresponding input pixel data, but instead merely determines the amount of time that the AND gate is on during a predetermined time period. Since Tomita never describes circuit 3 as a "chopping" unit then one must look to the definition provided by the Applicant. Accordingly, circuit 3 of Tomita fails to satisfy the definition set forth by the Applicant in the specification.

Hayashi et al. teaches controlling the amount of light of an exposure apparatus based on environmental conditions such as humidity in an image forming device employing a laser. This condition is totally different that the reason for which Tomita changes the power level (discussed above). Hayashi et al. however, does not employ an AND gate arrangement responsive to strobe pulses for gating a pixel as is found in Tomita. Accordingly, Hayashi et al. teaches that by detecting humidity levels in Applicant's Fig. 1, the power level of Applicant's Fig. 1 can be modified as taught in Hayashi et al. Since Hayashi et al., however, does not employ a "chopping means" as disclosed in the present application nor an AND gate as disclosed in Tomita, there is no teaching of using Tomita's AND gate circuit in Applicant's Fig. 1. Clearly Tomita's AND gate circuit has no means which could be controlled based on detected external conditions such as humidity. Thus the Examiner's attempt to provide support for modifying Applicant's Fig. 1 in view of Tomita based on the teachings of Hayashi et al. is untenable.

Therefore, the rejection is deemed to be in error and should be withdrawn.

The examiner is respectfully requested to reconsider the application, withdraw the objections and/or rejections and pass the application to issue in view of the above amendments and/or remarks.

Respectfully submitted,



Robert E. Bushnell
Attorney for Applicant
Reg. No.: 27,774

1511 K Street, N.W.
Washington, D.C. 20005
(202) 638-5740

Folio: P53706
Date: 12/28/95
I.D.: REB/MDP

ENERGY SAVING IMAGE-FORMING APPARATUS AND CONTROL METHOD THEREFOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This applications makes reference to, incorporates herein and claims all benefits available under 35 U.S.C. §119 from my patent application entitled Energy Saving Image-forming Apparatus And Control Method For Therefor earlier filed in the Korea Industrial Property Office on 23 Oct. 1993 and duly assigned Ser. No. 1993/22100.

BACKGROUND OF THE INVENTION

The present invention relates to an energy saving image-forming apparatus, and more particularly to an energy saving image-forming apparatus and a control method therefor which turns off power to circuits within the apparatus responsible for heavy power consumption when the image-forming apparatus is not used for a predetermined period of time.

The advent of the modern office has produced a marked increase in the use of equipment such as computers, facsimiles and duplicators. With many of these items, the amount of time the equipment is actually used is only twenty to thirty percent of total operating time. Accordingly, power consumed during periods of non-use (i.e. seventy to eighty percent of total operating time) is wasted unnecessarily. In an effort to promote environmentally safe products, the EPA (Environmental Protection Agency) has instituted a "green" designation for various types of equipment. For instance, when a computer with the "green" designation is not used for a predetermined period of time, the computer turns off power to components, such as the monitor, responsible for heavy power consumption. Accordingly, power is conserved while a user's exposure to potentially harmful electromagnetic waves is minimized. During this period of non-use, some components such as the ventilating fan are turned off, thereby reducing noise. Programs such as the "green" designation are adopted as part of EPA regulations.

Pursuant to the general industry trend of producing energy saving office equipment, several efforts have been made to make such equipment more and more power efficient. One eff rt is disclosed in U.S. Pat. No. 4,642,448 entitled Electrostatic Copying Apparatus issued to Shigemura et al. on 10 Feb. 1987. In this effort, an image forming apparatus is provided with an electrical heater having a heat controller for controlling energization and deenergization of the heater on the basis of detected temperature. The device also includes a manually operable power saving switch that produces a power saving signal to which the heat controller is partially responsive. Although that controller may produce some energy savings, I have found that a greater level of power efficiency can be obtained through the use of other techniques.

A more recent effort is disclosed in U.S. Pat. No. 5,241,349 entitled Image Forming Apparatus Having A Plurality Of Control Modes Of Thermal Fixing Apparatus issued to Nagasaka on 31 Aug. 1993. Here again, an image forming device is equipped with a section for controlling the temperature of a thermal fixing unit within the device. The device features three temperature control modes, each mode providing an additional level of energy savings. Although Nagasaka's effort reduces power being supplied to the thermal fixing unit in situations of reduced use, the embodiment described still provides no mechanism to reduce power to other portions of the device that are separately responsible for consuming large amounts of energy. Moreover, I have found that the energy efficiency of this device can be improved upon.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide an improved image forming apparatus and process.

It is another object to provide an image forming apparatus and an energy saving control method therefor that minimizes power consumption.

It is still another object to provide an energy saving, image forming apparatus and a control method therefor that implements primary and secondary modes of energy savings.

It is yet another object to provide an energy saving image forming apparatus and a control method therefor that maintains a minimum power level necessary for basic operation while in a secondary energy saving mode.

It is still yet another object to provide a device and process enabling incremental shedding of power consumption during varied operational conditions.

It is a still yet further object to provide a device and a process responding to a hiatus in usage by incrementally shedding consumption of power in a sequence of steps conforming to the division between a series of "warm-up" steps initiated in response to a request by a user for reactivation.

It is a further object to provide a device and process susceptible to both automatic and manual initiation of incremental shedding of power between instances of operational performance.

It is a still further object to provide a device and process accommodating incremental restoration of power to a plurality of operationally cooperating circuit stages in response to a single request by a user for reactivation of a printer.

It is a yet further object to provide a device and a process responding to hiatus in usage by incrementally shedding consumption of power and responding to a request by a user for reactivation by initiation of a sequence of "warm-up" steps beginning at a step conforming to the degree of incremental shedding accomplished.

To achieve these and other objects, an embodiment constructed according to the principles of the present invention controls an energy saving image-forming apparatus by establishing a primary energy saving mode when a user does not use the image-forming apparatus for a predetermined period of time, and establishes a secondary energy saving mode when a user inputs an energy saving signal.

The energy saving image-forming apparatus of the present invention provides a secondary energy saving key panel for generating the energy saving signal or a reactivation signal according to a user's key input. Power to a "primary energy saving circuit portion" is turned off during the primary energy saving mode. The "primary energy saving circuit portion" includes a heat lamp and a ventilating fan. Power to a "secondary energy saving circuit portion" and the "primary energy saving circuit portion" is turned off during the secondary energy saving mode. The "secondary energy saving circuit portion" includes components within the printer, such as an engine controller, an engine driver and an image processor. While in the secondary energy saving mode, input of the reactivation signal initiates a warm-up

operation f those components within the "secondary energy saving circuit porti n."

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation f this invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

FIG. **1** is a diagram providing an abstract representation of the components of one typical image forming system suitable for explaining the principles of the instant invention;

FIG. **2** is a simplified block diagram of a representative control system of an image forming system;

FIG. **3** is a flow chart diagram illustrating particular features of a conventional energy saving control process;

FIG. **4** is a partial single-line block diagram showing a power distribution and control circuit for saving energy in an image forming device constructed according to the principles of the present invention;

FIG. **5** is a detailed circuit diagram of the power controller shown in FIG. **4**;

FIG. **6** shows a detailed circuit diagram of the secondary energy saving controller shown in FIG. **4**;

FIG. **7** shows connections between the secondary energy saving controller, the secondary energy saving key panel and the input/output ports shown in FIG. **4**;

FIG. **8** is a flow diagram showing an energy saving control process performed according to the principles of the present invention; and

FIG. **9** is a detailed circuit diagram of an alternative implementation of the circuit illustrated in FIG. **7**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Generally, an image forming system (e.g., a laser beam printer, a photocopier or a facsimile machine) such as, by way of example, the electrophotographic developing system abstractly represented in FIG. **1**, has a plurality of moving and stationary electrically powered component parts collectively converting binary information (i.e., with the binary information typically received from an external source such as a modem or a personal computer coupled to the system) into images and recording those images upon record media such as, and again by way of example, cut sheets of paper, conveyed through the system. The exemplary system represented in FIG. **1** has a photosensitive drum **107** for forming an electrostatic latent image, a charging unit **104** for providing an uniform charge to photosensitive drum **107**, an exposure unit **105** for selectively exposing the surface of photosensitive drum **107** to light in correspondence with the binary information and thereby generating the electrostatic latent image upon photosensitive drum **107**, a developing unit **108** for developing the latent image formed as a consequence of the exposure of a transfer unit **106** for transferring a developer from photosensitive drum **107** to a record medium, a set of register rollers **109, 110** for feeding the medium, and fusing unit **103** for fusing the developer that has been transferred from ph tosensitive drum **107** to the medium. Location sensors **101, 111** detect the location of media conveyed through the system.

Referring n w to FIG. **2**, a schematic block diagram of the control circuit governing perational performance f a typical image-forming system uses a micro-processor based engine controller **6**, having a central processing unit CPU, random access memory RAM and read nly memory ROM, receives input signals from sensors such as locati n sensors **101, 111**, and transmits and receives vari us control signals to and from portions of FIG. **1**. A mechanical controller **301** produces signals for controlling motors and other moving mechanical components such as rotation of register rollers **109, 110** and rotation of photosensitive drum **107** and the rollers of fusing unit **103**. Control signals for controlling charging unit **104**, developing unit **108** and transfer unit **106** are generated by a developing processor controller **302**. A sensor input circuit **303** receives the sensed values from various sensors within the system. An image data generator **304** generates signals to control exposure unit **105**, thereby determining the substance of the images to be printed upon the record media. A micro-processor based image processor **12**, having a central processing unit CPU, read only memory ROM (e.g.,a font memory), and random access memory RAM, receives image data from the external source, such as a modem or personal computer. Image processor **12** processes image data to be printed in accordance with a program stored in its read only memory. The processed image data is then stored in its random access memory. An image processor, such as the one depicted in FIG. **2**, is typically referred to as a video controller.

Many image forming systems have an energy saving function to reduce energy consumption by turning off power supplied to circuits within the device responsible for heavy power consumption during periods of non-use. These power hungry circuits control the operation of components within the device such as the heat lamp, ventilating fan, and other major power consuming components, that are notorious f r heavy power consumption when the device is not being used. Power to these circuits is generally turned ff in accordance with a programmed method performed by a controller within the device. An abstract representati n of these features for a conventional energy saving technique is shown in FIG. **3** of the drawings.

Referring now to FIG. **3**, in step **202**, the printer makes a determination as to whether the power has been turned n. Once the power is turned on, the printer initiates a primary warm-up operation in step **204** by performing an internal set-up test and an initialization of the random access memory and the read only memory of the particular microprocessor based controller regulating the power saving operation. After the primary warm-up operation, a secondary warm-up operation is initiated in step **206**. The secondary warm-up operation includes activating the heat lamp and ventilating fan. Next, in step **208**, the printer determines when the printer is capable of performing a print operati n. Once the printer is able to print, a print ready state is established in step **210**. In the print ready state, the printer detects user inputs to determine whether the printer is in an operating state in step **212**. So long as the printer is being used, the print ready state is maintained. If the printer is not in the operating state, a determination is made in step **214** f whether a predetermined period of time has elapsed with ut receiving any user instructions. That is, upon receiving a user's instruction, the controller of the printer begins a timing operation. If the predetermined period of time elapses without receiving any subsequent instructions, an energy saving mode is established in step **216**. In the energy saving mode, the controller of the printer turns off (or reduces) power supplied to circuits within the printer responsible for